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VOLTAGE COMPARATOR CIRCUIT

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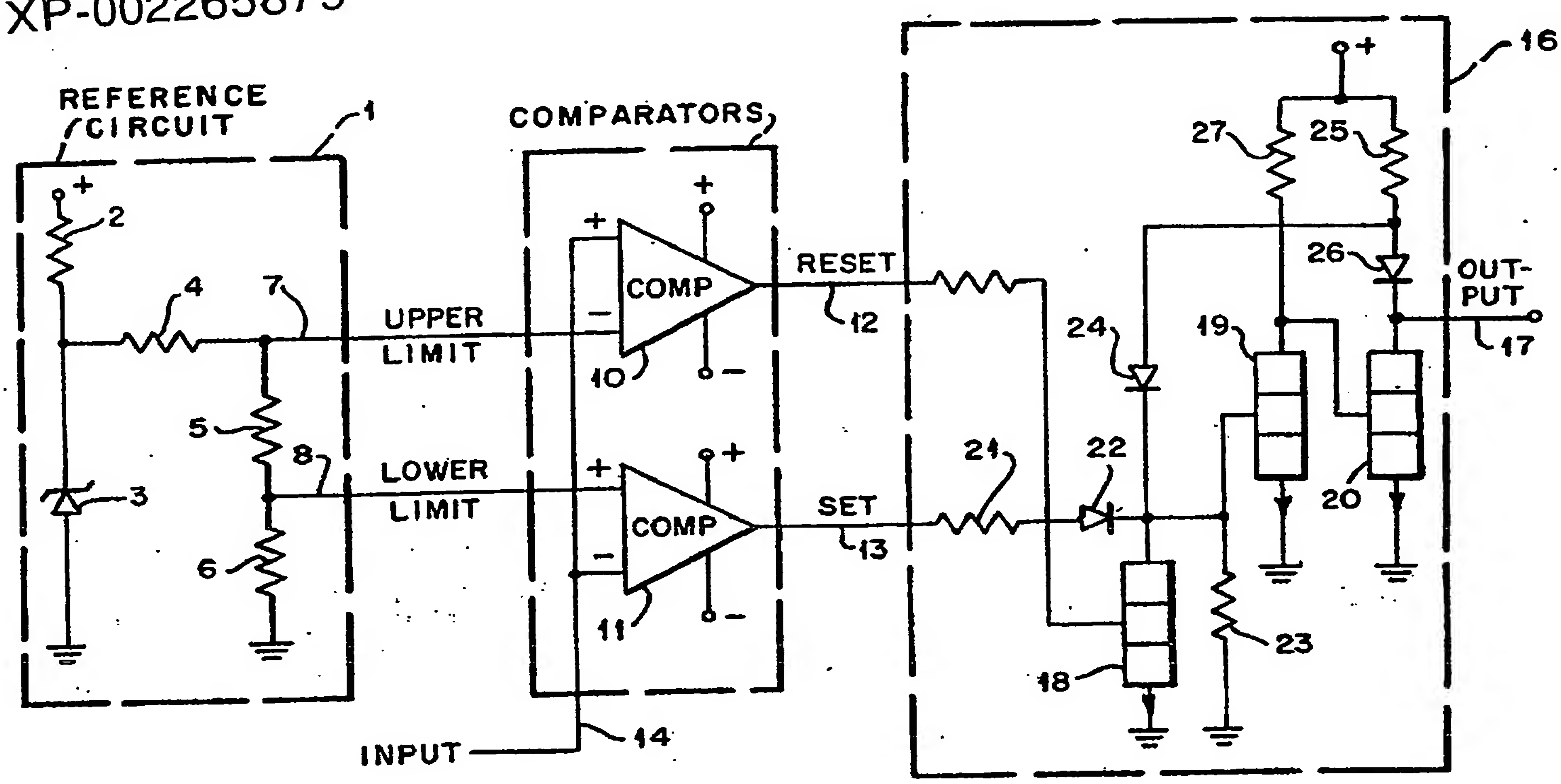

When an input voltage is to be compared with a standard voltage, a Schmitt trigger circuit is often used. The trigger will switch its state with a small hysteresis voltage. Where a small and accurate hysteresis voltage gap is required, a Schmitt trigger is not satisfactory and the circuit diagrammed can be used in its place.

The circuit shown can be set to switch state at accurately determined input voltages and as the state changing circuits do not individually have hysteresis, the switching voltages may be selected as closely as desired. The comparator uses two differential amplifiers to set and reset a latch circuit as the input voltage passes the two turn on-turn off points.

More specifically, in the diagram, a reference circuit 1 comprises a resistor 2 and a precision zener diode 3 in series across a voltage source. A series network of three resistors 4, 5, and 6 are across diode 3 to supply an upper limit and a lower limit voltage reference on leads 7 and 8, respectively.

A pair of comparator circuits 10 and 11, each similar to a differential amplifier in that an output lead will be energized when a + input receives a voltage which is more positive than that at a - input, provide a reset voltage on output 12 from comparator 10 and a set voltage on output 13 from comparator 12. The upper limit lead 7 is connected to the - input of comparator 10 and lower limit lead 8 is connected to the + input of comparator 11.

The input voltage on line 14, which is the voltage to be measured, is connected to the other inputs of comparators 10 and 11. The comparators will act to maintain a voltage on set line 13 so long as the input voltage on line 14 is below that on line 8, and to supply a reset signal on line 12 so long as the input voltage is above that on upper limit line 7. Neither output signal will be active if the input voltage is between the two limits.

A latch 16 is set and reset by the signals on lines 12 and 13 to provide a control signal on an output line 17. The latch comprises three transistors 18, 19, and 20, all having their emitters connected to the negative side of the power source and with output lead 17 connected to the collector of transistor 20. The set lead 13 is connected through a resistor 21 and diode 22 to the collector of transistor 18 and the base of transistor 19 having a bias resistor to the negative supply.

The collector of transistor 18 and the base of transistor 19 are also connected through a diode 24 to the load resistor 25 in the collector of transistor 20. A diode 26 between resistor 25 and the collector of transistor 20 serves to isolate the output circuit 17. A resistor 27 is the collector load for transistor 19, whose collector is directly connected to the base of transistor 20.

In operation, the presence of a set voltage on line 13 will start conduction in transistor 19, which will turn off transistor 20 and cause a biasing voltage to be passed by diode 24 to keep transistor 19 conductive when the set voltage ceases. A voltage on reset line 12 will turn on transistor 18 to lower the voltage through diode 24 to a point where transistor 19 goes off, to turn on transistor 20 which holds down the base voltage of transistor 19.

Thus the output will be switched by the operation of comparators 10 and 11 such that the output voltage is up when the set input is up, is down when the reset input is up, and retains the last setting when neither is up. As the ratios of the voltage divider resistors 4, 5, and 6 can be selected as desired, the control voltages and the voltage difference between them can be selected as desired.